Geomorphic impacts of the April 25, 2015 earthquake in Nepal: Preliminary assessments

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GEOMORPHIC IMPACTS OF THE APRIL 25, 2015 EARTHQUAKE IN NEPAL: PRELIMINARY ASSESSMENTS, A REVIEW

by **Monique FORT**

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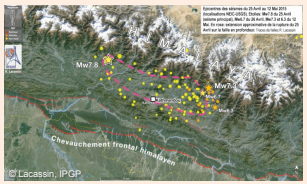
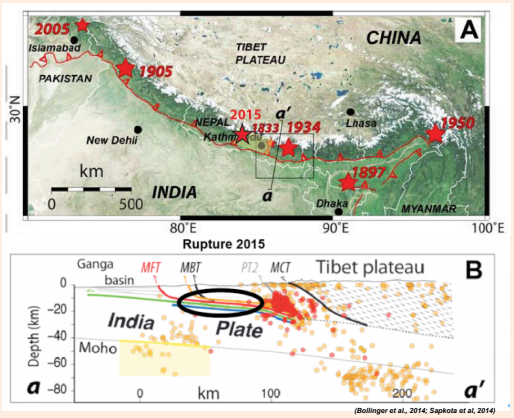
IAG MEMBERS

1. THE EVENT

A magnitude Mw 7.8 earthquake struck Central Nepal on April 25, 2015 at 11:41 am (local time), followed by another Mw 7.4 one on May 10, 2014 at 12:30 pm (local time). The first rupture took place along the Main Frontal Thrust, a main structure interface between Indian and Eurasian plates: it has occurred at a depth varying from 10 km (USGS) to 29 km (Geoscope) corresponding to a relative slip of 4-5 m. It was a forseeable disaster, with continuous seismic monitoring (Seismology Laboratory of Kathmandu) and preparedness actions such as infrastructure strengthening, development of early warning systems, plans for evacuation and recovery (thanks to the NSET NGO). Still it was very damageous.



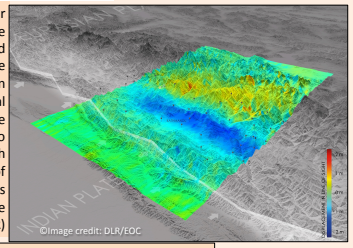
About ¼ Nepal population was affected (~8 M people), both in the mountains and Kathmandu valley (~2,5 M people). ~9000 people lost their lives. The economic damage -about $10 billion- is almost half of the country's GDP.



Aggravating factors are many folds. (1) In the Kathmandu valley, the Quaternary lacustrine substrate amplified the vibrations, hence substantially damaged the buildings. (2) After a dry winter, snowfalls and rainfalls were abundant during March and April, hence increasing the pore pressure and the potential instability of slopes and/or snow cover. (3 During the last decades, the construction of earthy, fragile roads accentuated, slope steepness. (4) Very short time left between the earthquake and the onset of the next Indian monsoon rains.

Sited N and NE of Gurkha, the locus of the seism hypocentre, other villages such as Salme, Laprak and Barpak, settled upon old landslide material, were >90% destroyed after the slope movement was reactivated by the quake.

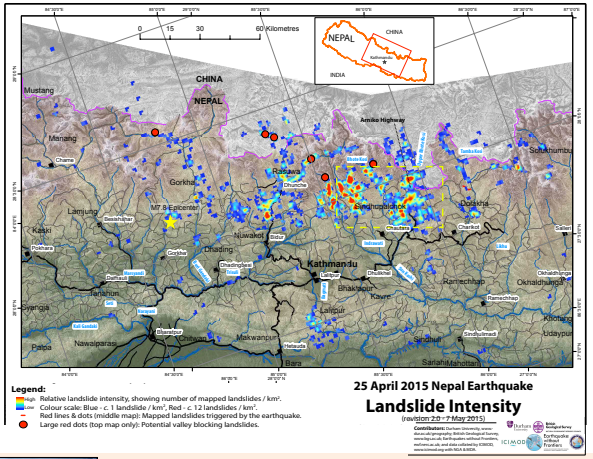
Use of satellite radar helped to calculate how the ground shifted during the earthquake. In addition to vertical movements, the researchers also detected north-south horizontal shifts of nearly 2 meters (German Aerospace Center - DLR)

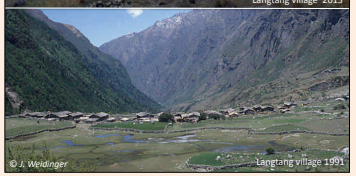


Monsoon rains: another aggravating factor, leaving little chance to the population to recover and to live under safer conditions

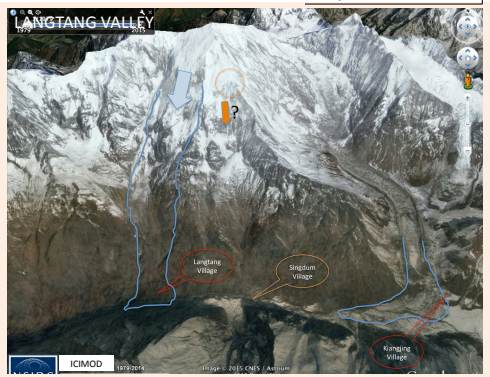
2. GEOMORPHIC IMPACTS

Though many fatalities are due to buildings collapses, a large part of them are also related to slope processes: snow avalanches, rock falls (including very large blocks), debris avalanches and landslides.

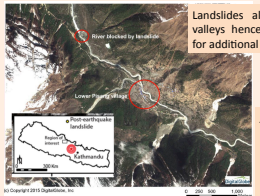




The village of Langtang was totally buried under a rock-snow avalanche that came from a glacier several hundred meters above,



on the Langtang Lirung peak (7227 m); apparently the debris were taken away from the moraines and carried downward by the avalanche.



Landslides also dammed river valleys hence causing potential for additional disasters to come.,

Acknowlegments

Information on earthquake data was provided by Laurent Bollinger (CEA/DASE). My very deep appreciation goes to him and Dr. Som Sapkota (Dpt of Mines and Geology, KTM) for their help.

WHAT'S NEXT?